

National Imaging Associates, Inc.*	
Clinical guidelines CHEST CTA	Original Date: September 1997
CPT Codes: 71275	Last Revised Date: April March 2022¹
Guideline Number: NIA_CG_022-1	Implementation Date: January 2023²

INDICATIONS FOR CHEST CTA

Chest Computed Tomography Angiography (CTA) is ordered for evaluation of the intrathoracic blood vessels. Chest CT and Chest CTA should not be approved at the same time.

Suspected Pulmonary Embolism (PE)¹⁻⁵

High (ACCP, 2013; ACR, 2020; Corrigan, 2016; Kirsch, 2017; Konstantinides, 2014)

- ~~High~~ risk for PE based on shock or hypotension
- ~~Intermediate or high r~~isk ~~can as be~~ determined by the parameters detailed in Background Overview section
- Positive D-dimer^{2, 4} ~~(Corrigan, 2016; Konstantinides, 2014)~~

Vascular Disease

- Superior vena cava (SVC) syndrome⁶ ~~(Friedman, 2017)~~
- Subclavian Steal Syndrome after positive or inconclusive ultrasound^{7, 8} ~~(Osire, 2012; Potter, 2014)~~
- Thoracic Outlet Syndrome^{9, 10} ~~(ACR, 2019; Povlsen, 2018)~~
- Takayasu's arteritis¹¹ ~~(Keser, 2014)~~
- Clinical concern for Acute Aortic dissection^{12, 13} ~~(ACR, 2017; Barman, 2014)~~
 - Sudden painful ripping sensation in the chest or back and may include
 - New diastolic murmur
 - Cardiac tamponade
 - Distant heart sounds
 - Hypotension or shock

Initial/Screening for Thoracic Aortic Disease¹⁴⁻¹⁶

~~(Erbel, 2014; Hannuksela, 2015; Hiratzka, 2010)~~

- Echocardiogram or chest x-ray show aneurysm
- Initial study for a suspected aneurysm

* National Imaging Associates, Inc. (NIA) is a subsidiary of Magellan Healthcare, Inc.

- Screening of first-degree relatives of individuals with a thoracic aortic aneurysm (defined as > 50% above normal) or dissection
 - Known connective tissue disease or genetic conditions that predispose to aortic aneurysm or dissection (e.g., Marfan syndrome, Ehlers Danlos or Loeys-Dietz syndromes)
- Screening of the thoracic aorta after a diagnosis of a bicuspid aortic valve (dilation of the ascending aorta may not be seen on echocardiogram)¹⁷ ~~(Berger, 2018)~~
 - If normal, re-image every three to five years
- Screening of first-degree relatives of patients with a bicuspid aortic valve
- Turner's syndrome – Screen for coarctation or aneurysm of the thoracic aorta
 - If normal results, screen every 5-10 years
 - If abnormal, screen annually
- Suspected vascular cause of dysphagia or expiratory wheezing with other imaging is suggestive or inconclusive

Follow-up after established Thoracic Aneurysm¹⁴⁻¹⁶

~~(Erbel, 2014; Hannuksela 2015; Hiratzka, 2010)~~

- Six months follow-up after initial finding of a dilated thoracic aorta, for assessment of rate of change
 - Aortic Root or Ascending Aorta (in cm)
 - 3.5 to 4.4 Annual
 - 4.5 to 5.5 or growth rate ≥ 0.5 cm/year - Every 6 months
 - Genetically mediated (Marfans syndrome, Aortic Root or Ascending Aorta) (in cm)
 - 3.5 to 4.4 Annual
 - 4.5 to 5.0 or growth rate ≥ 0.5 cm/year Every 6 months
 - Surgery generally recommended over 5.0 cm
 - Descending Aorta (in cm)¹⁸ ~~(Braverman, 2011)~~
 - 4.0 to 5.0 Annual
 - 5.0 to 6.0 Every 6 months
- Follow-up post medical treatment of aortic dissection:
 - Acute dissection: 1 month, 6 months, then annually
 - Chronic dissection: annually
- Follow-up post either root repair or AVR plus ascending aortic root/arch repair: baseline post-op, then annually
- Re-evaluation of known ascending aortic dilation or history of aortic dissection with a change in clinical status or cardiac exam or when findings may alter management

Congenital Malformations (Chest Magnetic Resonance Angiography preferred if pediatrics or repeat imaging)

- Thoracic malformation on other imaging (chest x-ray, echocardiogram, gastrointestinal study, or inconclusive CT)¹⁹⁻²² ~~(Ferreira, 2015; Hellinger, 2011; Karaosmanoglu, 2015; Poletto, 2017)~~

- Congenital heart disease with pulmonary hypertension²³ ~~(Pascall, 2018)~~ or vascular anomalies
- Pulmonary sequestration²⁴ ~~(Sancak, 2003)~~

Pulmonary Hypertension based on other testing^{25, 26}
~~(Ascha, 2017; Rose Jones, 2015)~~

- Echocardiogram
- Right heart catheterization

Atrial fibrillation with ablation planned²⁷
~~(Kolandaivelu, 2012)~~

Preoperative/procedural evaluation

- Pre-operative evaluation for a planned surgery or procedure

Post-operative/procedural evaluation

- Post-operative complications^{28, 29} ~~(Bennet, 2017; Choudhury, 2017)~~
- Routine post-operative^{30, 31} ~~(Lawrence, 2018; Uthof, 2012)~~
 - Thoracic endovascular or open surgical aneurysm repair
 - 1 month
 - More frequent follow-up/possible intervention if complication detected
 - If stable, annual for 5 years

Chest CTA and Abdomen CTA or Abdomen/Pelvis CTA

- Transcatheter Aortic Valve Replacement (TAVR)^{13, 32} ~~(Achenbach, 2012; ACR, 2017)~~
- Acute aortic dissection¹² ~~(Barman, 2014)~~
- Takayasu's arteritis¹¹ ~~(Kaser, 2014)~~
- Post-operative complications^{28, 29} ~~(Bennet, 2017; Choudhury, 2017)~~

BACKGROUND

Computed tomography angiography is a non-invasive imaging modality that may be used in the evaluation of thoracic vascular problems. Chest CTA (non-coronary) may be used to evaluate vascular conditions, e.g., pulmonary embolism, thoracic aneurysm, thoracic aortic dissection, aortic coarctation, or pulmonary vascular stenosis. The vascular structures as well as the surrounding anatomical structures are depicted by CTA.

OVERVIEW

CTA and Coarctation of the Aorta – Coarctation of the aorta is a common vascular anomaly characterized by a constriction of the lumen of the aorta distal to the origin of the left subclavian artery near the insertion of the ligamentum arteriosum. The clinical sign of coarctation of the aorta is a disparity in the pulsations and blood pressures in the legs and

arms. Chest CTA may be used to evaluate either suspected or known aortic coarctation and patients with significant coarctation should be treated surgically or interventionally.

CTA and Pulmonary Embolism (PE) – Note: D-Dimer blood test in patients at low risk for DVT is indicated prior to CTA imaging. Negative D-Dimer suggests alternative diagnosis in these patients.

CTA has high sensitivity and specificity and is the primary imaging modality to evaluate patients suspected of having acute pulmonary embolism. When high suspicion of pulmonary embolism on clinical assessment is combined with a positive CTA, there is a strong indication of pulmonary embolism. Likewise, a low clinical suspicion and a negative CTA can be used to rule out pulmonary embolism.

Low risk is not approved. Low risk is defined as **NO** to **ALL** of the following questions with intermediate and high risk defined based on the number of positive responses³³

~~(Konstantinides, 2020):~~

- Evidence of current or prior DVT;
- HR > 100;
- Cancer diagnosis;
- Recent surgery or prolonged immobilization;
- Hemoptysis;
- History of PE;
- Oral hormone use;
- Another diagnosis beside PE is less likely

CTA and Thoracic Aortic Aneurysms – Computed tomographic angiography (CTA) allows the examination of the precise 3-D anatomy of the aneurysm from all angles and shows its relationship to branch vessels. This information is very important in determining the treatment: endovascular stent grafting or open surgical repair.

CTA and Thoracic Aorta Endovascular Stent-Grafts – CTA is an effective alternative to conventional angiography for postoperative follow-up of aortic stent grafts. It is used to review complications after thoracic endovascular aortic repair. CTA can detect luminal and extraluminal changes to the thoracic aorta after stent-grafting and can be performed efficiently with fast scanning speed and high spatial and temporal resolution.

POLICY HISTORY

Date	Summary
<u>March 2022</u>	<ul style="list-style-type: none">• <u>For Suspected Pulmonary Embolism, clarified 'intermediate or high risk' as determined by parameters detailed in Overview section and included hyperlink to Overview section</u><u>Reviewed literature for updates.</u>
April 2021	<ul style="list-style-type: none">• Follow-up recommendations for bicuspid aortic valve.

	<ul style="list-style-type: none"> • Added suspected vascular cause of dysphagia or expiratory wheezing • Combined follow-up surveillance recommendations for endovascular and open ascending aorta repair as per literature review • Clarified pre-operative evaluation for a planned surgery or procedure
May 2020	<ul style="list-style-type: none"> • For Suspected Pulmonary Embolism, removed: ‘Low Risk is not approved’ section • Moved Vascular Disease content from Chest CT to Chest CTA, including: <ul style="list-style-type: none"> ○ <i>Initial evaluation of aneurysm</i> <ul style="list-style-type: none"> ▪ <i>Echocardiogram shows aneurysm</i> ▪ <i>Echocardiogram inconclusive of proximal aorta and first degree relative with thoracic aneurysm</i> ▪ <i>Chest x-ray shows possible aneurysm</i> • <i>Follow-up after established Thoracic Aneurysm (above these sizes surgery is usually recommended)</i> <ul style="list-style-type: none"> ○ <i>Aortic Root or Ascending Aorta</i> <ul style="list-style-type: none"> ▪ <i>3.5 to 4.5 Annual</i> ▪ <i>4.5 to 5.4 Every 6 months</i> ○ <i>Genetically mediated (Marfans syndrome, Aortic Root or Ascending Aorta)</i> <ul style="list-style-type: none"> ▪ <i>3.5 to 4.0 Annual</i> ▪ <i>4.0 to 5.0 Every 6 months</i> ○ <i>Descending Aorta</i> <ul style="list-style-type: none"> ▪ <i>4.0 to 5.0 Annual</i> ▪ <i>5.0 to 6.0 Every 6 months</i> • Thoracic Aortic Disease <ul style="list-style-type: none"> ○ Organized into two sections: <ul style="list-style-type: none"> ▪ Initial/Screening ▪ Follow-up of known aneurysm/vascular pathology <ul style="list-style-type: none"> ○ Removed: ‘Annual follow up of enlarged thoracic aorta that is above top normal for age, gender, and body surface area’
May 2019	<ul style="list-style-type: none"> • Expanded vascular indications including: <ul style="list-style-type: none"> ○ Superior vena cava syndrome ○ Takayasu’s arteritis ○ Subclavian steal syndrome after positive or inconclusive ultrasound • Expanded indications for congenital anomalies to include pulmonary sequestration • Updated thoracic aortic section to match cardiac guidelines

REFERENCES

Achenbach S, Delgado V, Hausleiter J, et al. SCCT expert consensus document on computed tomography imaging before transcatheter aortic valve implantation (TAVI)/transcatheter aortic valve replacement (TAVR). *J Cardiovasc Comput Tomogr*. 2012; 6(6):366–80.

American College of Chest Physicians (ACCP). Choosing Wisely®: Five things physicians and patients should question. 2013. Retrieved from <http://www.choosingwisely.org/clinician-lists/american-college-chest-physicians-american-thoracic-society-chest-ct-angiography-to-evaluate-possibly-pulmonary-embolism/>.

American College of Radiology (ACR). ACR Appropriateness Criteria®. Retrieved from <https://acsearch.acr.org/list>. 2020.

American College of Radiology (ACR). ACR Appropriateness Criteria®: Imaging for transcatheter aortic valve replacement. ACR, 2017. Retrieved from <https://acsearch.acr.org/docs/3082594/Narrative/>.

American College of Radiology (ACR). ACR Appropriateness Criteria® Thoracic Outlet Syndrome. Published 2019. Accessed August 3, 2021. <https://acsearch.acr.org/docs/3083061/Narrative/>.

Ascha M, Renapurkar RD, Tonelli AR. A review of imaging modalities in pulmonary hypertension. *Ann Thorac Med*. 2017; 12(2):61–73.

Barman M. Acute aortic dissection. *Euro Soc Cardiol*. 2014; 12(25):02.

Bennet KM, Kent KC, Schumaker J, et al. Targeting the most important complications in vascular surgery. *J Vasc Surg*. 2017; 65(3):793–803.

Borger MA, Fedak PWM, Stephens EH, et al. The American Association for Thoracic Surgery consensus guidelines on bicuspid aortic valve-related aortopathy: Full online-only version. *J Thorac Cardiovasc Surg*. 2018;156(2):e41–e74. doi:10.1016/j.jtcvs.2018.02.115

Braverman A, Thompson R, Sanchez L. Diseases of the aorta. In: Braunwald's heart disease, 9th ed, Bonow R, Mann D, Zipes D, Libby P (Eds), Elsevier, Philadelphia 2011. p.1309.

Choudhury M. Postoperative Management of Vascular Surgery Patients: A Brief Review. *Clin Surg*. 2017; 2:1584.

Corrigan D, Pruenal C, Kabrhel C. Pulmonary embolism: the diagnosis, risk stratification, treatment and disposition of emergency department patients. *Clin Exp Emerg Med*. 2016; 3(3): 117–125.

Erbil R, Aboyans V, Boileau C, et al. 2014 ESC Guidelines on the diagnosis and treatment of aortic diseases: Document covering acute and chronic aortic diseases of the thoracic and

abdominal aorta of the adult. The Task Force for the Diagnosis and Treatment of Aortic Diseases of the European Society of Cardiology (ESC). *Eur Heart J*. 2014; 35(41):2873.

Ferreira TDA, Chagas ISS, Ramos RTT, et al. Congenital thoracic malformations in pediatric patients: two decades of experience. *J Bras Pneumol*. 2015; 41(2):196-199.

Friedman T, Quencer KB, Kishore SA, et al. Malignant Venous Obstruction: Superior Vena Cava Syndrome and Beyond. *Semin Intervent Radiol*. 2017; 34(4):398.

Hannuksela M, Eva-Lena Stattin E, Johansson B, et al. Screening for familial thoracic aortic aneurysms with aortic imaging does not detect all potential carriers of the disease. *Aorta (Stamford)*. 2015 Feb; 3(1): 1-8.

Hellinger JC, Daubert M, Lee EY, et al. Congenital thoracic vascular anomalies: Evaluation with state-of-the-art MR imaging and MDCT. *Radiol Clin N Am*. 2011; 49:969-996.

Hiratzka LF, Bakris GL, Beckman JA, et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM guidelines for the diagnosis and management of patients with Thoracic Aortic Disease: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, American Association for Thoracic Surgery, American College of Radiology, American Stroke Association, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of Thoracic Surgeons, and Society for Vascular Medicine. *Circulation*. 2010; 121(13):e266.

Karaosmanoglu AD, Khawaja RD, Onur MR, et al. CT and MRI of aortic coarctation: Pre- and postsurgical findings. *AJR Am J Roentgenol*. March 2015; 204(3):W224-33. Retrieved from <https://www.ajronline.org/doi/10.2214/AJR.14.12529>.

Keser G, Direskeneli H, Aksu K. Management of Takayasu arteritis: a systematic review. *Rheumatology*. 2014; 53(5):793-801.

Kirsch J, Brown RKJ, Henry TS, et al. ACR Appropriateness Criteria® Acute Chest Pain-Suspected Pulmonary Embolism. *JACR*. 2017; 14(Suppl 5):S2-S12.

Kolandaivelu A. Role of Cardiac Imaging (CT/MR) Before and After RF Catheter Ablation in Patients with Atrial Fibrillation. *J Atr Fibrillation*. 2012 Aug-Sep; 5(2):523.

Konstantinides SV, Meyer G, Becattini C, et al. 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS): The Task Force for the diagnosis and management of acute pulmonary embolism of the European Society of Cardiology (ESC). *Euro Heart J*. 2020; 41(4):543-603.

~~Konstantinides SV, Torbicki A, Agnelli G, et al. 2014 ESC Guidelines on the diagnosis and management of acute pulmonary embolism: The Task Force for the Diagnosis and Management of Acute Pulmonary Embolism of the European Society of Cardiology (ESC). *Euro Heart J*. 2014; 35(43):3033–3080.~~

~~Lawrence PF. Society for Vascular Surgery: Recommendations for follow-up after vascular surgery procedures. *SVS Practice Guidelines*. 2018; 68(1):1. Retrieved from [https://www.jvascsurg.org/article/S0741-5214\(18\)31069-3/fulltext](https://www.jvascsurg.org/article/S0741-5214(18)31069-3/fulltext).~~

~~Long Q, Zha Y, Yang Z. Evaluation of pulmonary sequestration with multidetector computed tomography angiography in a select cohort of patients: A retrospective study. *Clinics (Sao Paul)*. 2016; 71(7):392–398.~~

~~Osiro S, Zurada A, Gielecki J, et al. A review of subclavian steal syndrome with clinical correlation. *Med Sci Monit*. 2012;18(5): RA57–RA63.~~

~~Pascall E, Tulloh RMR. Pulmonary hypertension in congenital heart disease. *Future Cardiol*. 2018; 14(4): 343–353.~~

~~Poletto E, Mallon MG, Stevens RM, et al. Imaging review of aortic-vascular rings and pulmonary sling. *J Am Osteopath Coll Radiol*. 2017; 6(2):5–14.~~

~~Potter BJ, Pinto DS. Subclavian Steal Syndrome. *Circulation*. 2014; 129:2320–2323.~~

~~Povlsen S, Povlsen B. Diagnosing thoracic outlet syndrome: Current approaches and future directions. *Diagnostics (Basel)*. 2018; 8(1):21.~~

~~Rose-Jones LJ, McLaughlin VV. Pulmonary hypertension: Types and treatments. *Curr Cardiol Rev*. 2015; 11(1):73–79.~~

~~Sancak T. The role of contrast enhanced three-dimensional MR angiography in pulmonary sequestration. *Interactive Cardiovascular and Thoracic Surgery*. 2003;2(4):480–482. doi:10.1016/S1569-9293(03)00118-X.~~

~~Uthof H, Pena C, Katzen BT, et al. Current clinical practice in postoperative endovascular aneurysm repair imaging surveillance. *J Vasc Intervent Radiol*. 2012; 23(9):1152–1159.~~

~~Zierler RE, Jordan WD, Lal BK, et al. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. 2018 Jul 1; 68(1):256–84.~~

~~Reviewed / Approved by NIA Clinical Guideline Committee~~

~~GENERAL INFORMATION~~

~~It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.~~

Disclaimer: Magellan Healthcare service authorization policies do not constitute medical advice and are not intended to govern or otherwise influence the practice of medicine. These policies are not meant to supplant your normal procedures, evaluation, diagnosis, treatment and/or care plans for your patients. Your professional judgement must be exercised and followed in all respects with regard to the treatment and care of your patients. These policies apply to all Magellan Healthcare subsidiaries including, but not limited to, National Imaging Associates ("Magellan"). The policies constitute only the reimbursement and coverage guidelines of Magellan. Coverage for services varies for individual members in accordance with the terms and conditions of applicable Certificates of Coverage, Summary Plan Descriptions, or contracts with governing regulatory agencies. Magellan reserves the right to review and update the guidelines at its sole discretion. Notice of such changes, if necessary, shall be provided in accordance with the terms and conditions of provider agreements and any applicable laws or regulations.

1. American College of Radiology. ACR Appropriateness Criteria® Suspected Pulmonary Embolism American College of Radiology (ACR). Updated 2016. Accessed January 4, 2022. <https://acsearch.acr.org/docs/69404/Narrative/>
2. Corrigan D, Prucnal C, Kabrhel C. Pulmonary embolism: the diagnosis, risk-stratification, treatment and disposition of emergency department patients. *Clin Exp Emerg Med*. Sep 2016;3(3):117-125. doi:10.15441/ceem.16.146
3. American College of Chest Physicians, American Thoracic Society. Five things physicians and patients should question. Choosing Wisely Initiative ABIM Foundation. Updated October 27, 2013. Accessed December 22, 2021. <https://www.choosingwisely.org/societies/american-college-of-chest-physicians-and-american-thoracic-society/>
4. Konstantinides SV, Torbicki A, Agnelli G, et al. 2014 ESC guidelines on the diagnosis and management of acute pulmonary embolism. *Eur Heart J*. Nov 14 2014;35(43):3033-69, 3069a-3069k. doi:10.1093/eurheartj/ehu283
5. Kirsch J, Brown RKJ, Henry TS, et al. ACR Appropriateness Criteria(®) Acute Chest Pain-Suspected Pulmonary Embolism. *J Am Coll Radiol*. May 2017;14(5s):S2-s12. doi:10.1016/j.jacr.2017.02.027

6. Friedman T, Quencer KB, Kishore SA, Winokur RS, Madoff DC. Malignant Venous Obstruction: Superior Vena Cava Syndrome and Beyond. *Semin Intervent Radiol*. Dec 2017;34(4):398-408. doi:10.1055/s-0037-1608863
7. Osiro S, Zurada A, Gielecki J, Shoja MM, Tubbs RS, Loukas M. A review of subclavian steal syndrome with clinical correlation. *Med Sci Monit*. May 2012;18(5):Ra57-63. doi:10.12659/msm.882721
8. Potter BJ, Pinto DS. Subclavian steal syndrome. *Circulation*. Jun 3 2014;129(22):2320-3. doi:10.1161/circulationaha.113.006653
9. Povlsen S, Povlsen B. Diagnosing Thoracic Outlet Syndrome: Current Approaches and Future Directions. *Diagnostics (Basel)*. Mar 20 2018;8(1)doi:10.3390/diagnostics8010021
10. American College of Radiology. ACR Appropriateness Criteria® Thoracic Outlet Syndrome. American College of Radiology. Updated 2019. Accessed December 22, 2021. <https://acsearch.acr.org/docs/3083061/Narrative/>
11. Keser G, Direskeneli H, Aksu K. Management of Takayasu arteritis: a systematic review. *Rheumatology (Oxford)*. May 2014;53(5):793-801. doi:10.1093/rheumatology/ket320
12. Barman M. Acute aortic dissection. *ESC e-J Cardio Pract*. 2014;12(25):02Jul2014. doi:<https://www.escardio.org/Journals/E-Journal-of-Cardiology-Practice/Volume-12/Acute-aortic-dissection>
13. American College of Radiology. ACR Appropriateness Criteria® Imaging for Transcatheter Aortic Valve Replacement. American College of Radiology. Updated 2017. Accessed January 4, 2022. <https://acsearch.acr.org/docs/3082594/Narrative/>
14. Erbel R, Aboyans V, Boileau C, et al. 2014 ESC Guidelines on the diagnosis and treatment of aortic diseases: Document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult. The Task Force for the Diagnosis and Treatment of Aortic Diseases of the European Society of Cardiology (ESC). *Eur Heart J*. Nov 1 2014;35(41):2873-926. doi:10.1093/eurheartj/ehu281
15. Hannuksela M, Stattin EL, Johansson B, Carlberg B. Screening for Familial Thoracic Aortic Aneurysms with Aortic Imaging Does Not Detect All Potential Carriers of the Disease. *Aorta (Stamford)*. Feb 2015;3(1):1-8. doi:10.12945/j.aorta.2015.14-052
16. Hiratzka LF, Bakris GL, Beckman JA, et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM guidelines for the diagnosis and management of patients with Thoracic Aortic Disease: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, American Association for Thoracic Surgery, American College of Radiology, American Stroke Association, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of Thoracic Surgeons, and Society for Vascular Medicine. *Circulation*. Apr 6 2010;121(13):e266-369. doi:10.1161/CIR.0b013e3181d4739e
17. Borger MA, Fedak PWM, Stephens EH, et al. The American Association for Thoracic Surgery consensus guidelines on bicuspid aortic valve-related aortopathy: Full online-only version. *J Thorac Cardiovasc Surg*. Aug 2018;156(2):e41-e74. doi:10.1016/j.jtcvs.2018.02.115
18. Braverman A, Thompson R, Sanchez L. Diseases of the aorta. In: Bonow R, Mann D, Zipes D, Libby P, eds. *Braunwald's heart disease*. 9th ed. Elsevier; 2011:1309.

19. Ferreira Tda A, Chagas IS, Ramos RT, Souza EL. Congenital thoracic malformations in pediatric patients: two decades of experience. *J Bras Pneumol*. Mar-Apr 2015;41(2):196-9. doi:10.1590/s1806-37132015000004374
20. Hellinger JC, Daubert M, Lee EY, Epelman M. Congenital thoracic vascular anomalies: evaluation with state-of-the-art MR imaging and MDCT. *Radiol Clin North Am*. Sep 2011;49(5):969-96. doi:10.1016/j.rcl.2011.06.013
21. Karaosmanoglu AD, Khawaja RD, Onur MR, Kalra MK. CT and MRI of aortic coarctation: pre- and postsurgical findings. *AJR Am J Roentgenol*. Mar 2015;204(3):W224-33. doi:10.2214/ajr.14.12529
22. Poletto E, Mallon MG, Stevens RM, CM A. Imaging Review of Aortic Vascular Rings and Pulmonary Sling. *J Am Osteopath Coll Radiol*. 2017;6(2):5-14.
23. Pascall E, Tulloh RM. Pulmonary hypertension in congenital heart disease. *Future Cardiol*. Jul 2018;14(4):343-353. doi:10.2217/fca-2017-0065
24. Sancak T, Cangir AK, Atasoy C, Ozdemir N. The role of contrast enhanced three-dimensional MR angiography in pulmonary sequestration. *Interact Cardiovasc Thorac Surg*. Dec 2003;2(4):480-2. doi:10.1016/s1569-9293(03)00118-x
25. Ascha M, Renapurkar RD, Tonelli AR. A review of imaging modalities in pulmonary hypertension. *Ann Thorac Med*. Apr-Jun 2017;12(2):61-73. doi:10.4103/1817-1737.203742
26. Rose-Jones LJ, McLaughlin VV. Pulmonary hypertension: types and treatments. *Curr Cardiol Rev*. 2015;11(1):73-9. doi:10.2174/1573403x09666131117164122
27. Kolandaivelu A. Role of Cardiac Imaging (CT/MR) Before and After RF Catheter Ablation in Patients with Atrial Fibrillation. *J Atr Fibrillation*. Aug-Sep 2012;5(2):523. doi:10.4022/jafib.523
28. Bennett KM, Kent KC, Schumacher J, Greenberg CC, Scarborough JE. Targeting the most important complications in vascular surgery. *J Vasc Surg*. Mar 2017;65(3):793-803. doi:10.1016/j.jvs.2016.08.107
29. Choudhury M. Postoperative management of vascular surgery patients: a brief review. *Clin Surg*. 2017;2:1584.
30. Lawrence PF, Gloviczki P. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. *J Vasc Surg*. Jul 2018;68(1):1. doi:10.1016/j.jvs.2018.05.012
31. Uthoff H, Peña C, Katzen BT, et al. Current clinical practice in postoperative endovascular aneurysm repair imaging surveillance. *J Vasc Interv Radiol*. Sep 2012;23(9):1152-9.e6. doi:10.1016/j.jvir.2012.06.003
32. Achenbach S, Delgado V, Hausleiter J, Schoenhagen P, Min JK, Leipsic JA. SCCT expert consensus document on computed tomography imaging before transcatheter aortic valve implantation (TAVI)/transcatheter aortic valve replacement (TAVR). *J Cardiovasc Comput Tomogr*. Nov-Dec 2012;6(6):366-80. doi:10.1016/j.jcct.2012.11.002
33. Konstantinides SV, Meyer G, Becattini C, et al. 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS). *Eur Heart J*. Jan 21 2020;41(4):543-603. doi:10.1093/eurheartj/ehz405

ADDITIONAL RESOURCES

1. Long Q, Zha Y, Yang Z. Evaluation of pulmonary sequestration with multidetector computed tomography angiography in a select cohort of patients: A retrospective study. *Clinics (Sao Paulo)*. Jul 2016;71(7):392-8. doi:10.6061/clinics/2016(07)07
2. Zierler RE, Jordan WD, Lal BK, et al. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. *J Vasc Surg*. Jul 2018;68(1):256-284. doi:10.1016/j.jvs.2018.04.018

Reviewed / Approved by NIA Clinical Guideline Committee

GENERAL INFORMATION

It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.

Disclaimer: Magellan Healthcare service authorization policies do not constitute medical advice and are not intended to govern or otherwise influence the practice of medicine. These policies are not meant to supplant your normal procedures, evaluation, diagnosis, treatment and/or care plans for your patients. Your professional judgement must be exercised and followed in all respects with regard to the treatment and care of your patients. These policies apply to all Magellan Healthcare subsidiaries including, but not limited to, National Imaging Associates ("Magellan"). The policies constitute only the reimbursement and coverage guidelines of Magellan. Coverage for services varies for individual members in accordance with the terms and conditions of applicable Certificates of Coverage, Summary Plan Descriptions, or contracts with governing regulatory agencies. Magellan reserves the right to review and update the guidelines at its sole discretion. Notice of such changes, if necessary, shall be provided in accordance with the terms and conditions of provider agreements and any applicable laws or regulations.